

OBSERVATIONS ON THE BIONOMICS OF *PANCHAX*
LINEATUS CUVIER AND VALENCIENNES, WITH
SPECIAL REFERENCE TO ITS LARVICIDAL
PROPENSITIES.

BY

A. G. FRASER, I.M.D.

The opportunity of making the following observations was provided by Mr. Adams who showed the writer a pool near Poona containing a large number of specimens of the 'Top-Minnow' *Panchax lineatus* Cuv. & Val. The local Hindi name of the fish is *Konkani garah*. It can be readily distinguished from the other local fishes by the possession of a silver star mark on the head. The pool referred to above is situated on the south bank of the Mutha-Mulla river and, at the time of our visit, contained specimens of *P. lineatus* only, though from the end of the channel connecting the pool with the river a young *Ophicephalus* was also obtained. The paucity of the fish-fauna of the pool was probably due to the fact that it was at the time stagnant and very foul with evidence of sulphuretted hydrogen emanations. There was a heavy scum on the greater portion of its surface with fragments of floating algae. The pool was about 15 feet in diameter with an average depth of 18 inches. The bed was practically rocky throughout and grown with algae; some portions of the bank and the bed at the edges were overgrown with long grasses and weeds.

Field observations show that *Panchax lineatus* has the habit of lying for hours on end nearly flat with the surface film. When disturbed it dives below, and after 4 to 5 minutes reappears again to resume its position at the surface. Dorsally in a line with and behind the eyes there is a bright silver shield—shaped somewhat like the letter I in very thick type—the lustre of which when viewed from the bank and also in the aquarium is very striking. Owing to the sheen on this silver patch one is able to spot these fishes in the clearer portions of the pool almost at once, especially if the sun is shining when the scintillation produced by it is very noticeable. In the aquarium, when the fish were placed in a very dark corner of the room, the silver shield faded away and was replaced by a black or greatly dulled blotch; and at times, when there was a dim light streaming into the room, the lustre of the shield waxed and waned. When exposed to the glare of sunlight, or in the light of a dull day when clouds hide the sun, the lustre of the shield is always bright. The more light, the brighter does the sheen and scintillation become and the fishes themselves tend to turn towards the source from which the light is falling. Fishermen tell me that this species lies at the

surface and waits for insects to fly over, when it leaps out for them. I was unable to confirm their statement as during my visits to the pool there was no ocular evidence of this habit. Owing to my observations having been made during the rainy season when the skies are overcast with clouds, and also because of an absence of small insects—large red and blue dragon flies were numerous and disturbed the fishes by darting down on the surface of the water—the fish, in the matter of insect food, were perhaps at a seasonal disadvantage.

The habitat of *Konkani garah* and the evidence of fishermen indicate that it is probably an insectivorous fish. Mr. Adams informs me that he has never at any time of the year been able to find larvae of mosquitoes in the pool from which the fishes were recovered. I can certainly say there were no larvae present in this pool at the time of my four visits within a period of a fortnight during June-July, 1937.

In the aquarium, as in the pool, the fishes lie flat on the surface film, particularly if the water is foul. The same foul water from the pool was used to keep a batch of 6 fishes, and 6 others were kept in a receptacle containing clear tap water.¹ One fish in the clear water receptacle died after 24 hours, but five others lived on without showing any ill effects. They only occasionally rose to the surface, but remained most of the time below in mid-water; and even in this situation the silver shield on the head remained bright as long as the fishes were directly exposed to light. When kept in a dark corner of the room the lustre of the shield gradually faded to black. On the other hand, those kept in foul water with green algae in it, remained the whole time—night and day—at the surface film, practically motionless except for a slight wriggle of the caudal and pectoral fins and with them also the shield shone brightly when in the light. The position of the fish at the surface film is such that they lie almost flat with it. The head with the silver shield is under water, but the dorsal ridge from this point backwards is flush with the surface right up to the caudal fin which is below the water line. The dorsal fin near to the caudal fin is partly above the water level. The fish will remain thus for hours unless disturbed. It should be noted that the mouth is only imperceptibly opened in the act of breathing and that the gill covers are seen to move very slightly as the respiratory rate is very slow. Some fishes leaped out of the receptacle and it was then noticed that the silver shield became black and remained so as long as the fishes were out of the water. As a matter of interest, I kept three of these fishes in a wet handkerchief and observed them from time to time and at the end of 6 hours all were alive and during the whole period they remained in a form of suspended animation with the shield showing up dulled and dark. There was no evidence of any respiratory movement or gasping for air as in the case of other

¹ Tap water should usually be allowed to mature for at least 48 hours before it is used for aquarium purposes.—S. L. H.

surface fishes when out of water. They only wriggled or jumped if touched. One was restored to water and it recovered in ten minutes. The other two died after $6\frac{3}{4}$ hours and, only in the final stages of death, showed respiratory embarrassment by opening their mouths and muscularly exerting the gill covers. After death the colour tones became much darker. Another physical presentation is that the body is semi-transparent; the vertebral column is visibly defined as a dark shadow, so also are the stomach and the lungs, but the swim bladder is not seen as is the case with the glass-perch *Ambassis ranga*. A curious fact is that the fish, which died after a stay of 24 hours in clear water, showed the silver head shield still fairly bright; this has not yet faded in preservative up to now—a period of about one month—it is quite white but without the sheen observed in the living fish. The two fishes which were kept in a wet handkerchief and died after $6\frac{3}{4}$ hours also show a subdued discoloured patch. In all the others which had to be killed in preservative the shields have become black.

The significance of the phenomenon observed in connection with the silver shield is at this stage very difficult to explain. The behaviour of the fish and the photosensitivity of the shield on the head appear to indicate that it may be a means of attracting those insects which are usually drawn towards light. It was observed in an aquarium that at night when there is no luminosity the shield is quite dark. It reacts to artificial electric light in the same way as to daylight. This would indicate that during moonlit nights, when myriads of small insects hover over pieces of water for breeding purposes, the silvery head spot is capable of shining and presumably of attracting insects. These facts therefore, appear to support the conjecture that the silvery spot is a specialization which enables the fish to attract the particular kinds of insects required as food. Further investigation is required to confirm this purely tentative theory.

Colouration: When alive the fishes are pretty. Dorsally there is a dark colour tone on a background of buff with a slightly yellowish green tinge. The caudal and anal fins are piped in scarlet. The dorsal fin is yellow and faintly pink at the tips with a basal black dot, and the junction with the body is stippled with silver. The pectoral fins are also yellow and the area behind them is stippled with crimson dots. The body is semi-transparent. The anterior portion of the anal fin is prolonged into two red stained rays. There are 7-8 transverse black bands on the posterior half of the body.

[The mosquito-larvae eating propensities of the genus *Panchax* are well-known, and several workers have already reported the absence of mosquito larvae from pieces of water in which these 'Top-Minnows' live. Mr. Fraser's observations show that *P. lineatus* can live in very foul waters and that it can subsist on aerial respiration alone for considerable periods. Moreover, the tentative hypothesis concerning the function of the silver spot on the head, advanced for the first time, seems to be well worth further investigation. If it proves to be a fact that the silver

spot is used for attracting insects, then in *Panchax* we shall not only have an agent for destroying mosquito larvae but also a trap for luring adult mosquitoes that visit suitable pieces of water for breeding purposes. It may be noted that adult mosquitoes have often been found among the stomach contents of *P. panchax* (Hamilton). Reference may also be made to certain fishes, which live in deep seas, and emit light from special organs to attract their prey. It would thus seem that Mr. Fraser's view concerning the utility of the silver spot is not in any way extravagant.

The habits and habitat of *P. panchax*, the well-known *Ti-Choki* fish (the three-eyed fish, in the third eye reference is made to the shining, silvery spot on the head) of Bengal are similar to the Peninsular species—*P. lineatus*. While determining the utility of *P. panchax* in keeping pieces of water free of mosquito larvae, Nair and I kept one valve chamber opposite the Engine Room of the Pulta Pumping Station as a control and introduced no fish in it. In three other chambers specimens of *P. panchax* were introduced early in July. Occasional inspection of the chambers showed that no mosquito larvae were present in the chambers containing the fish, while in the control chamber the water became very foul and in about half a pint of water taken from the surface there were over 200 mosquito larvae on the 7th of August, 1937. Ten specimens of *P. panchax* were introduced in the evening, but two died during the night. More specimens were introduced the following day and by the evening the number of mosquito larvae in the chamber was reduced to 4 or 5 in half a pint of surface water. These observations show that *P. panchax*, like its congener *P. lineatus*, can live in very foul waters and is an effective larvicide.

Two specimens of *P. panchax* were left in a small glass bowl on wet cotton wool and the bowl was covered with a wet piece of cloth at about 8 p.m. At 8 a.m. next morning both the specimens were alive, but one died an hour after, while the second was revived by keeping it in water. This experiment bears out the hardy nature of these fishes, and shows the ease with which it should be possible to transport them over long distances.

In connection with the subject of the larvicidal fishes of India, it seems desirable to refer to an earlier observation made by Mr. Fraser while stationed at Deolali in the Nasik District. He found that a stagnant pool in a disused quarry was kept free of mosquito larvae by a small Carp-Minnow, *Rasbora labiosa* Mukerji, a remarkable fish which has developed a special contrivance, by the hypertrophy of the lower lip, for catching insects by jumping out of the water. The fishes of the genus *Rasbora* are usually regarded of moderate utility in destroying mosquito larvae, but it seems probable that they may prove very useful for local needs in certain areas.—S. L. Hora.]